Water budgets of the two Olentangy River experimental wetlands in 2003

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Introduction

Hydrologic conditions are extremely important for the maintenance of wetland structure and function. Biota, water quality and vegetation dynamics determine a wetland's overall water budget (Mitsch and Gosselink, 2000). Since 1994, a combination of manual and automated observations has provided a wealth of information on the daily, and even hourly, water fluxes of the two experimental wetlands at the Olentangy River Wetland Research Park (ORWRP). Previous annual water budgets and flood event descriptions for the experimental wetlands are presented by Wu et al. (1995), Nairn et al. (1996), Mitsch (1996), Wang et al. (1997, 1998), Wang and Mitsch (1999), Zhang et al. (2000), and Zhang and Mitsch (2001, 2002 and 2003). These reports provide estimates of daily water fluxes and flooding events of the two Olentangy River experimental wetlands for each year. As part of a long-term wetland ecosystem study begun in 1994 in the two experimental wetland basins, the water budget for 2003 is presented here. To allow water budgets to be compiled on a consistent basis, there is a need to follow previous procedures and modeling approaches while integrating observations, in part because of the very abundance of data and also because of the periodic occurrence of atypical events such as floods and equipment malfunctions. These procedures were used as a model in developing the 2003 wetland water budgets. In Janurary 2003, we started a pulsing experiment for the two experimental wetland basins whereby floods were introduced to each wetland basin beginning in the winter of 2003.

Methods

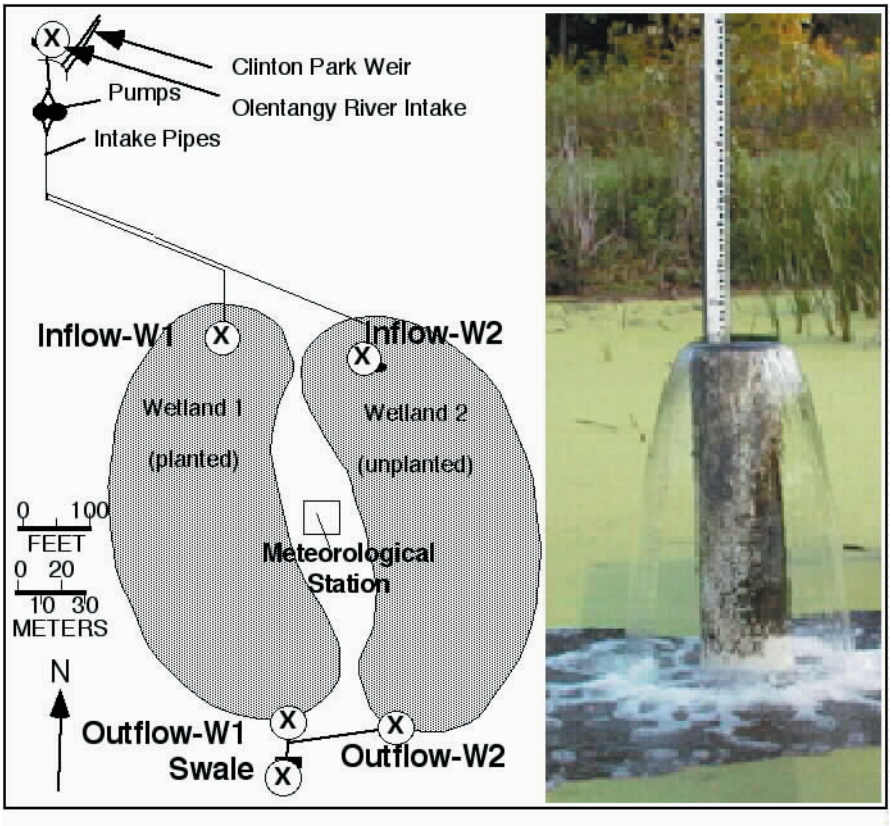


Figure 1. Location of pumped inflows and outflows of Wetland 1 and Wetland 2 at ORWRP. Hydrologic sampling stations are marked, and the inflow of Wetland 1 is shown on the right.

Locations of the inflows and outflows are shown in Figure 1. The following general equation (Mitsch and Gosselink, 2000) was used to determine a water budget for each ORWRP experimental wetland:

$$S_i + F_i + P - S_o - ET - G_o - \Delta V = 0 \qquad (1)$$

where,

S_i = pumped inflow (surface)
F_i = flood inflow (due to floods on the Olentangy River)
P = precipitation
S_o = surface outflow
ET = evapotranspiration
G_o = ground water outflow (seepage)
ΔV = change in volume

All parameters were developed in equivalent units for a budget calculation; either average flow rate (i.e., gpm) over a given time period, or total depth (i.e., cm) over a given time period, where total area was taken as a nominal 10,000 m^3 (1 ha) for each wetland. A 4-hour time increment was used as the basis for computing all parameters. However, the budget is reported only for daily values.

Pumped Inflow (S_i)

Twice-daily (morning and evening) readings of both instantaneous and total integrated volume of pumping rates were collected by staff and students from the flow monitors in each pipe going to each wetland. Many gaps have continued to exist in the data when flow gauges clogged or when readings were missed. When data from only one wetland inflow were available, the missing flow rate was assumed to be the same as the available flow rate (the protocol for the experimental wetlands has been, since the start, to deliver the same flow to each wetland at all times). When both flow gauges were malfunctioning, flow was estimated for both from the best estimate of previous readings or from pump settings (number of turns open) also, staff gages were installed on the inflow pipe of each inflow pipe (Figure 1). The calibration curve was developed for water height of inflow plume versus flow as measured by both the meter and by velocity calibration (Zhang and Mitsch, 2002). When pumps were shut down, either by site managers or by accident, the time of shutdown was estimated from field records and flow was prorated for only the period when pumps were not operating.

For the 2003 budget, readings from the inflow meters were interpolated to determine 4-hour total flow increments, in gallons, for each wetland. Water level recorder data charts, when available, were used to determine exact times of power outages or other unusual occurrences.

Pulsing Inflow

We started a pulsing experiment for W1 and W2 in 2003, and created high inflow pumping conditions for about 6-7 days in the beginning of every winter and spring month, and non-pulsing (normal inflow) in other days.

Flood Inflow (F_i)

A flooding event occurred in August 30, 2003, and flood water flowed into the experimental basins W1 and W2. The flooding duration was about 5 hours.

Precipitation (P)

Precipitation was downloaded from the OSU Agronomy Farm weather station, located 1 km from the ORWRP. Liquid precipitation in the form of snow was not easily accounted for during winter.

Surface Outflow (S_o)

Outflow measurements from the experimental wetlands are based on wetland water level and the status of the control weir boxes constructed at the southern edge of the basins (Zhang and Mitsch, 2001). The three important variables needed are: 1) the water level in the basins; 2) the status of weirs or other control devices in the weir boxes; and 3) the crest elevation of the weir or other control device. These data are then used with weir equations that relate head to rate of outflow. When outflow was blocked with debris, outflow was estimated from equation 1.

Wetland Water Level

From the beginning of the project, water level has been recorded twice-per-day by reading a staff gauge located near the outflow. These data are supplementated with continuous water level Ott Thalimedes data loggers installed in 2001 in W1 and W2.

Weir Box Status

Four different conditions of weir box outflow control have occurred since 1995: v-notch plate in place (V+0); v-notch and one stoplog in place (V+1); v-notch and two stoplogs in place (V+2); and no v-notch or stoplog (noweir). Details of computing outflow with v-notch were given in Wang and Mitsch (1999). Major changes in hydrological pumping and weirs in 2003 are presented in Table 1.

Flow Equations

Normally, rating curves developed from velocity readings in the outflow pipes downstream of the weirs were used to estimate outflow. These empirical equations are:

1) no weir:

$$\text{for W1: } S_o = 0.4(\text{water level} - 0.44)^{3.490} \qquad (2)$$

$$\text{for W2: } S_o = 0.59(\text{water level} - 0.68)^{2.747} \qquad (3)$$

where

S_o = outflow, cfs,

2) with weirs (V+0) (Wang and Mitsch, 1999):

$$\text{for W1: } S_o = 2.49(\text{water level} - 0.92)^{3.490} \qquad (4)$$

$$\text{for W2: } S_o = 0.59(\text{water level} - 1.29)^{2.747} \qquad (5)$$

Evapotranspiration (ET)

For 2003, evapotranspiration was estimated from the

Table 1. Major changes in hydrological pumping, pulsing and weirs in 2003.

Date and time	Pump change		Status	Weir code	Date and time	Pump change		Status	Weir code
1/9/03 9:00	ON	OFF		no weir	7/4/03 11:00	ON	OFF		no weir
1/9/03 17:45	OFF	OFF		no weir	7/5/03 9:40	OFF	OFF		no weir
1/10/03 9:30	ON	OFF		no weir	7/7/03 9:50	ON	OFF		no weir
2/1/03 11:00	On	OFF	Pulsing	no weir	8/2/03 0:00	ON	OFF	Pulsing	no weir
2/2/03 9:30	ON	OFF	Pulsing	no weir	8/2/03 10:10	ON	OFF	Pulsing	no weir
2/4/03 9:00	ON	OFF	Pulsing	no weir	8/2/03 12:25	ON	OFF	Pulsing	no weir
2/4/03 17:10	ON	OFF	Pulsing	no weir	8/4/03 8:40	ON	OFF	Pulsing	no weir
2/5/03 9:00	ON	OFF	Pulsing	no weir	8/5/03 15:55	ON	OFF	Pulsing	no weir
2/6/03 18:00	ON	OFF	Pulsing	no weir	8/6/03 17:40	ON	OFF	Pulsing	no weir
2/7/03 9:30	ON	OFF	Pulsing	no weir	8/7/03 8:30	ON	OFF	Pulsing	no weir
3/3/03 16:00	ON	OFF	Pulsing	no weir	8/7/03 19:00	ON	OFF	Pulsing	no weir
3/4/03 9:30	ON	OFF	Pulsing	no weir	8/9/03 12:05	ON	OFF	Pulsing	
3/4/03 17:30	ON	OFF	Pulsing	no weir	8/10/03 8:45	OFF	OFF		
3/5/03 8:40	ON	OFF	Pulsing	no weir	8/11/03 0:00	OFF	OFF		no weir
3/6/03 10:00	ON	OFF	Pulsing	no weir	8/16/03 10:00	OFF	OFF		no weir
3/6/03 17:45	ON	OFF	Pulsing	no weir	8/14/03 17:30	OFF	OFF		no weir
4/1/03 16:25	ON	OFF	Pulsing	no weir	8/16/03 9:35	OFF	OFF		no weir
4/2/03 10:35	ON	ON	Pulsing	no weir	8/25/03 8:00	ON	OFF		no weir
4/3/03 7:30	ON	OFF	Pulsing	no weir	8/27/03 9:00	OFF	OFF		no weir
4/4/03 8:30	ON	ON	Pulsing	no weir	8/28/03 18:30	OFF	OFF		no weir
4/7/03 10:39	ON	OFF	Pulsing	no weir	8/28/03 19:00	OFF	OFF		no weir
4/7/03 17:30	ON	ON	Pulsing	no weir	8/30/03 18:30	OFF	OFF		no weir
4/8/03 8:20	ON	OFF	Pulsing	no weir	9/1/03 11:00	OFF	OFF		no weir
4/8/03 10:20	ON	ON	Pulsing	no weir	9/1/03 13:00	OFF	OFF		no weir
5/1/03 9:00	ON	OFF	Pulsing	no weir	9/1/03 17:10	OFF	OFF		no weir
5/1/03 17:30	ON	OFF	Pulsing	no weir	9/1/03 21:00	OFF	OFF		no weir
5/3/03 9:00	ON	OFF	Pulsing	no weir	9/2/03 10:15	OFF	OFF		no weir
5/4/03 9:20	ON	OFF	Pulsing	no weir	9/3/03 9:50	OFF	OFF		no weir
5/5/03 10:15	ON	OFF	Pulsing	no weir	9/4/03 8:00	OFF	OFF		no weir
5/5/03 17:30	ON	OFF	Pulsing	no weir	9/6/03 11:00	OFF	OFF		no weir
5/6/03 9:00	ON	OFF	Pulsing	no weir	9/11/03 8:40	OFF	OFF		no weir
5/6/03 16:50	ON	OFF	Pulsing	no weir	9/11/03 18:15	OFF	OFF		no weir
5/7/03 9:50	ON	OFF	Pulsing	no weir	9/13/03 11:15	OFF	OFF		no weir
5/7/03 17:00	ON	OFF	Pulsing	no weir	9/15/03 8:30	OFF	OFF		no weir
5/17/03 12:45	ON	OFF	Pulsing	no weir	9/16/03 11:20	OFF	OFF		no weir
5/18/03 17:00	OFF	OFF		no weir	9/17/03 9:40	OFF	OFF		no weir
5/19/03 7:30	OFF	OFF		no weir	9/18/03 8:30	OFF	OFF		no weir
5/19/03 0:00	OFF	OFF		no weir	9/21/03 17:15	ON	OFF		no weir
5/20/03 8:05	OFF	OFF		no weir	9/22/03 8:00	OFF	OFF		no weir
5/20/03 18:15	OFF	OFF		no weir	9/22/03 18:00	OFF	OFF		no weir
5/21/03 18:40	OFF	OFF		no weir	9/23/03 10:00	OFF	OFF		no weir
5/22/03 10:00	OFF	OFF		no weir	9/23/03 17:00	OFF	OFF		no weir
5/22/03 16:00	OFF	OFF		no weir	9/24/03 4:30	OFF	OFF		no weir
5/22/03 16:30	ON	OFF		no weir	9/25/03 8:30	OFF	OFF		no weir
5/22/03 16:40	OFF	ON		no weir	9/25/03 18:30	OFF	OFF		no weir
5/22/03 0:00	OFF	OFF		no weir	9/26/03 8:20	OFF	OFF		no weir
5/22/03 16:57	OFF	ON		no weir	9/26/03 17:49	OFF	OFF		no weir
5/22/03 17:00	OFF	ON		no weir	9/29/03 9:00	OFF	OFF		no weir
5/22/03 17:01	OFF	OFF		no weir	9/29/03 18:20	OFF	OFF		no weir
5/22/03 17:05	OFF	ON		no weir	9/30/03 9:30	OFF	OFF		no weir
5/22/03 17:10	ON	OFF		no weir	9/30/03 10:35	OFF	OFF		no weir
6/1/03 11:50	ON	OFF	Pulsing	no weir	9/30/03 17:40	OFF	OFF		no weir
6/2/03 7:40	ON	OFF	Pulsing	no weir	10/1/03 7:20	OFF	OFF		no weir
6/2/03 18:25	ON	OFF	Pulsing	no weir	10/1/03 16:39	OFF	OFF		no weir
6/2/03 18:45	ON	OFF	Pulsing	no weir	10/2/03 8:30	OFF	OFF		no weir
6/3/03 15:45	ON	OFF	Pulsing	no weir	10/2/03 18:00	OFF	OFF		no weir
6/4/03 9:30	ON	OFF	Pulsing	no weir	10/3/03 8:15	OFF	OFF		no weir
6/13/03 7:00	OFF	OFF		no weir	10/3/03 11:55	ON	OFF		no weir
6/14/03 9:00	OFF	OFF		no weir	11/17/03 7:20	ON	OFF		no weir
6/14/03 12:00	OFF	OFF		no weir	11/17/03 16:35	OFF	OFF		no weir
6/14/03 12:01	ON	OFF		no weir	11/18/03 16:45	OFF	OFF		no weir
6/16/03 9:50	OFF	OFF		no weir	11/20/03 8:36	OFF	OFF		no weir
6/16/03 9:52	ON	OFF		no weir	11/21/03 8:26	OFF	OFF		no weir
					11/21/03 13:00	ON	OFF		no weir
					12/8/03 8:10	ON	OFF		no weir
					12/8/03 16:10	OFF	OFF		no weir
					12/9/03 16:40	ON	OFF		no weir

ORW data from 1999.

Seepage to Ground Water (G_o)

Changes in wetland volume during these periods that were not accounted for by precipitation or evapotranspiration could be used to estimate seepage, as follows:

$$G_o = -\Delta V + P - ET \quad (6)$$

Time periods during which the no-inflow/no-outflow criteria were satisfied occurred when pumps were shut down, either for drawdown or for maintenance reasons, and wetland water levels were below the weir.

Change in Volume (ΔV)

Net change in wetland volume over any given period was determined using beginning and ending water levels and the known relationship between water levels and wetland volume.

Results and Discussion

Figures 2 and 3 show pumped inflows and water levels of both Wetland 1 and Wetland 2 in 2003. Figure 4 shows a hydrograph for the natural flooding event in August 30, 2003 when water level readings reached 3.15 and 2.17 ft for W1 and W2 respectively. Figure 5 presents the pulsing inlfow (gpm) and water level readings for W1 and W2 during the the pulsing period of January through June 2003. That data was extracted from an iChart program with a reading interval of 30 min. Table 2 summarizes the pulsing events from January through June, 2003 for W1 and W2, including pulsing time, duration, average, maximum and minimum rates.

Annual and monthly hydrologic budgets area summarized for 2003 in Table 3. There were no pump inflows for W1 and W2 at the end of August and September 2003. In 2003, total inflows to Wetlands 1 and 2 were 25.5 and 22.4 m, respectively. Surface outflow for 2003 was estimated to

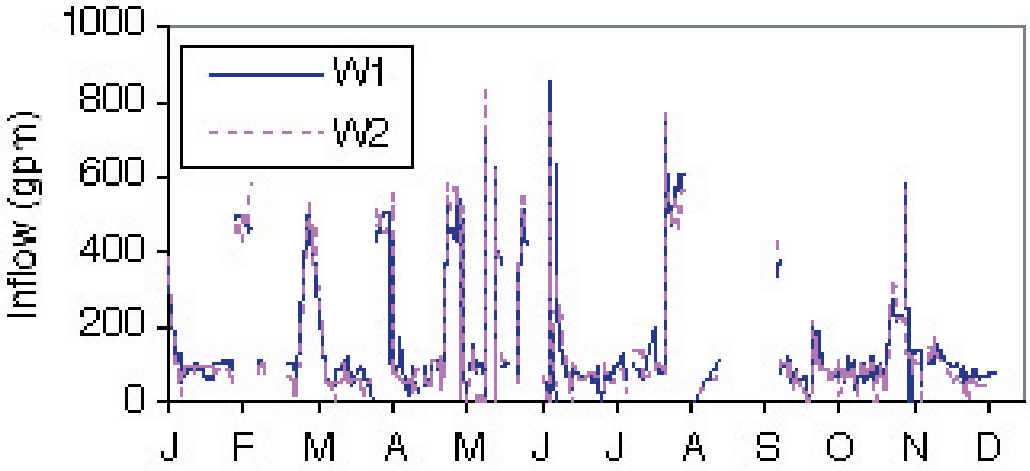


Figure 2. Pumped inflow of Wetland 1 and Wetland 2 in 2003.

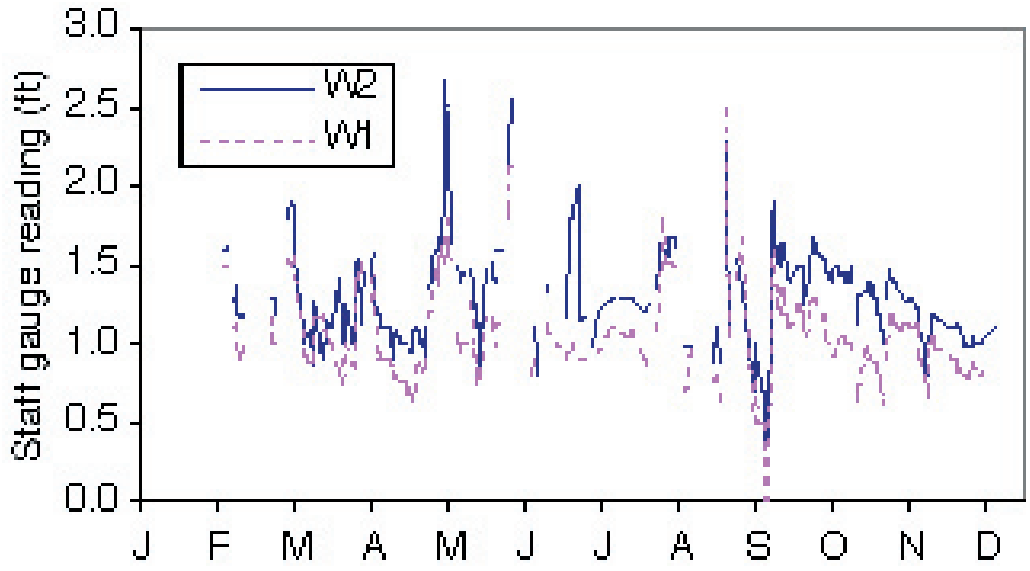
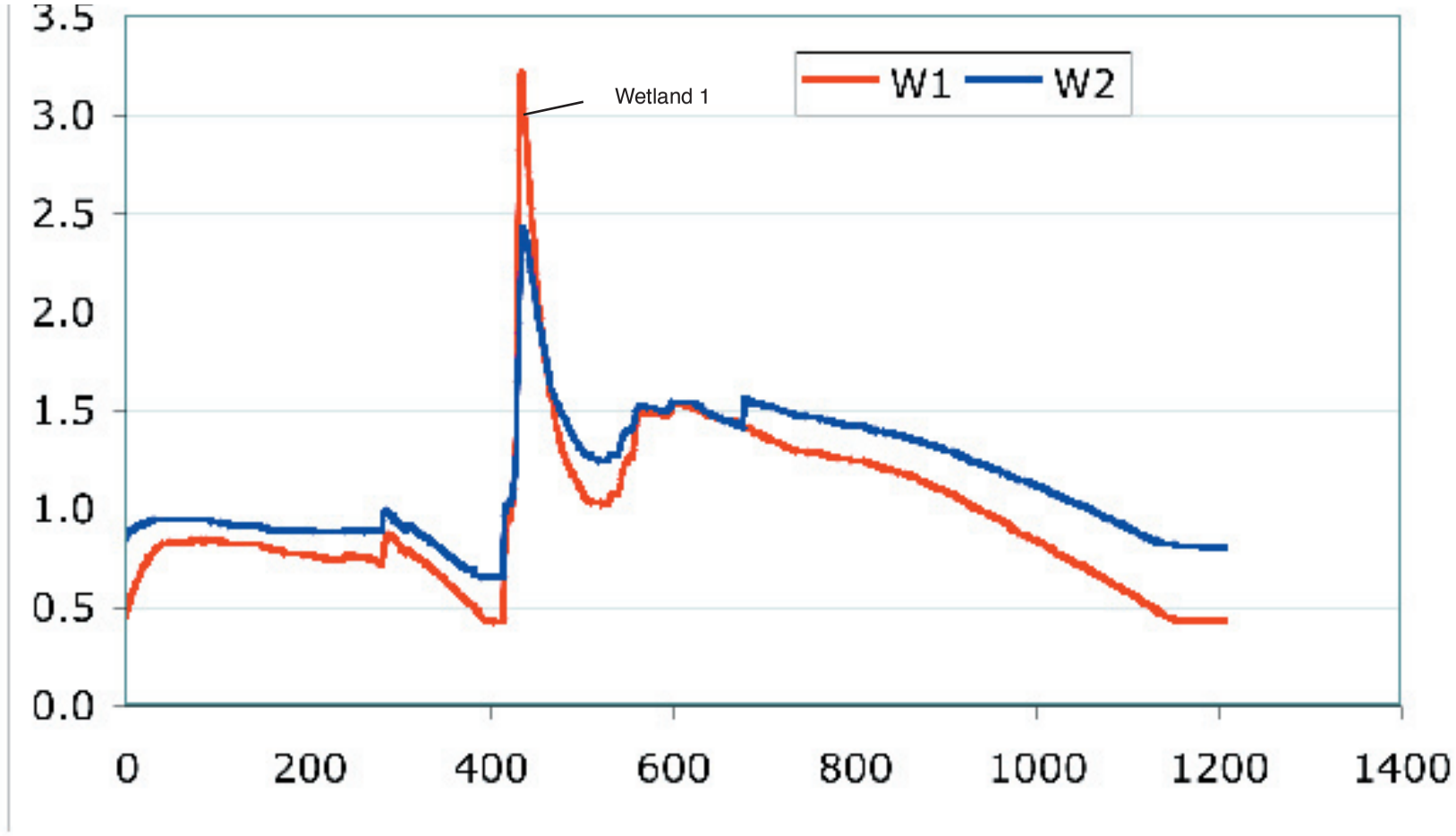


Figure 3. Water level of Wetland 1 and Wetland 2 in 2003.



Flooding periods: 8/30/2003 5:00am - 10:30 am

waterlevel (ft)	W1	1.05	3.15
	W2	1.05	2.17

Figure 4. Water level of Wetland 1 and Wetland 2 on August 30, 2003 during natural flood from Olentangy River.

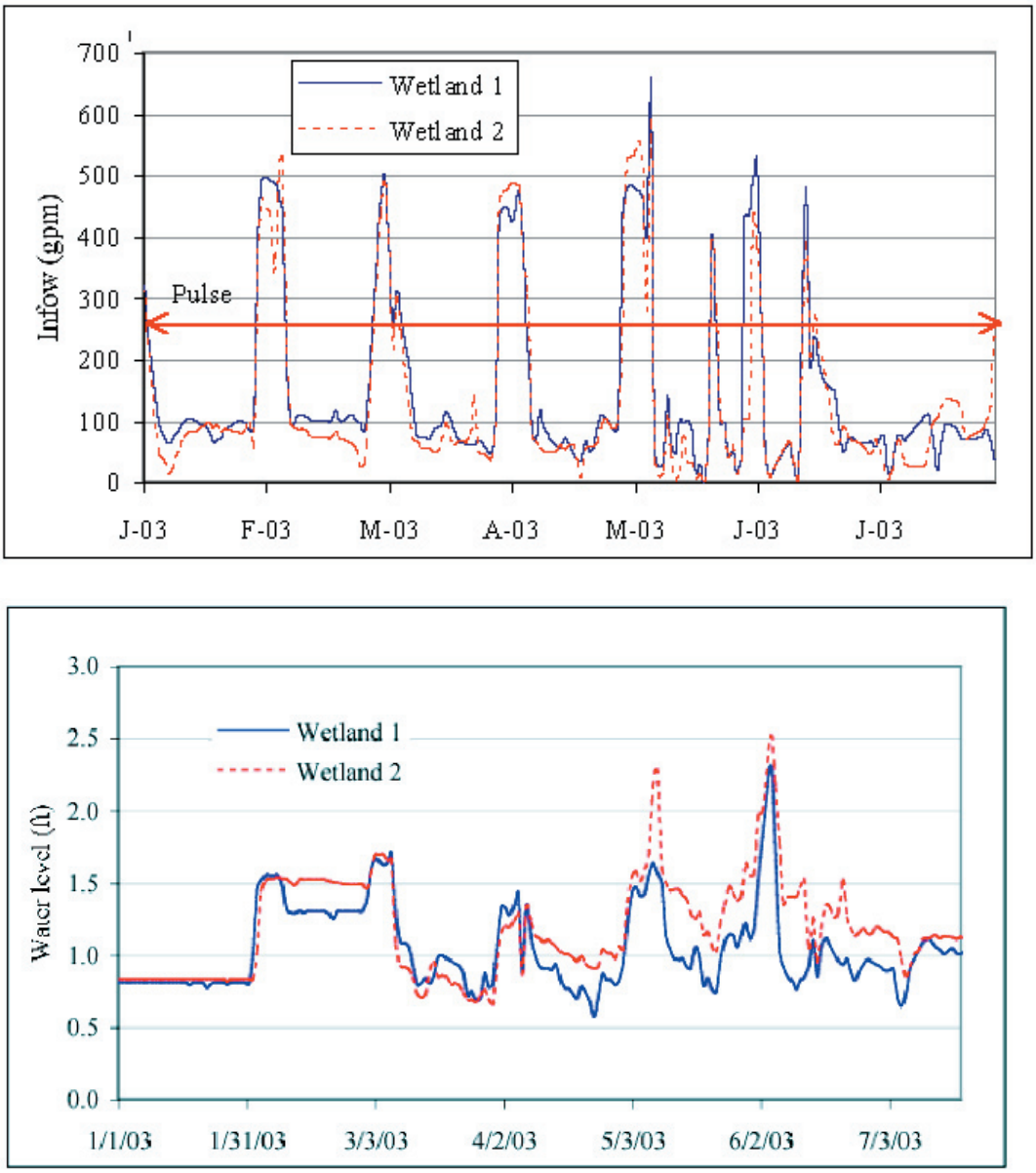


Figure 5. Pumped inflow and water level of Wetland 1 and Wetland 2 during the pulsing period in 2003. Data were extracted from an iChart program with a 30-min reading interval at the YSI Data center, Heffner Wetland Research and Education Building.

Table 2. Pulsing events, duration and average rates for W1 and W2, in 2003.

			Wetland 1				Wetland 2			
Pulsing Events	Date		Days	Ave (gpm)	Max	Min	Days	Ave (gpm)	Max	Min
No	Start	End								
1	1/4/03	1/6/03	3	253	312	194	3	233	304	162
2	2/1/03	2/7/03	7	468	495	409	7	442	530	342
3	3/1/03	3/8/03	8	348	501	348	8	329	488	217
4	4/1/03	4/8/03	8	406	471	220	8	441	488	306
5	5/1/03	5/8/03	8	482	650	404	8	471	590	246
6	5/23/03	5/25/03	3	235	427	83	3	254	491	
7	6/1/03	6/5/03	5	445	576		5	471	606	
8	6/14/03	6/15/03	2	295	885		2	335	744	

be 17.2 and 19.8 m for W1 and W2 respectively. Daily flows on which these budgets were based are attached in Appendix A

.

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Table 3. Monthly and annual water budgets of the two Olentangy River experimental wetlands in 2003.

	WET 1							WET 2					
Month	inf.(m)	outf(m)	Precip.	ET	seepg	D vol	Month	inf.(m)	outf.(m)	Precip.	ET	seepg	D vol
Jan	1.6	0.5	0.0	0.0	1.1	0.0	Jan	1.4	0.2	0.0	0.0	1.2	-0.1
Feb	3.0	1.9	0.0	0.1	1.1	0.0	Feb	2.6	2.0	0.0	0.1	0.5	0.0
Mar	2.6	1.3	0.0	0.1	1.3	0.0	Mar	2.3	1.0	0.0	0.1	1.2	0.0
Apr	2.7	1.2	0.1	0.0	1.6	0.0	Apr	2.6	1.1	0.1	0.0	1.6	0.0
May	3.3	2.2	0.3	0.1	1.4	0.0	May	2.8	3.0	0.3	0.1	0.0	0.1
Jun	2.5	3.9	0.1	0.0	-1.4	0.0	Jun	2.1	6.5	0.1	0.0	-4.3	-0.1
Jul	1.2	0.5	0.1	0.2	0.5	0.0	Jul	1.3	0.7	0.1	0.2	0.5	0.0
Aug	3.0	1.6	0.3	0.1	1.9	-0.2	Aug	2.6	1.1	0.3	0.1	1.7	0.0
Sept	0.8	2.6	0.2	0.1	-1.9	0.2	Sept	0.5	1.7	0.2	0.1	-1.1	0.0
Oct	1.3	0.9	0.1	0.1	0.4	0.0	Oct	1.4	1.8	0.1	0.1	-0.4	0.0
Nov	2.3	0.6	0.1	0.0	1.8	0.0	Nov	2.1	0.7	0.1	0.0	1.5	0.0
Dec	1.1	0.0	0.1	0.0	1.0	0.0	Dec	0.7	0.0	0.1	0.0	0.7	0.0
Total	25.5	17.2	1.3	0.9	8.8	0.0	Total	22.4	19.8	1.3	0.9	3.2	-0.1-

Appendix A. Daily water budgets (cm) of the two Olentangy River experimental wetlands in 2003.

Wetland 1							Wetland 2						
Date	Inf.	Outf.	Precip.	Evap.	Seep	D Vol.	Date	Inf.	Outf.	Precip.	Evap.	Seep.	D Vol.
1/1/03	0.0	5.8	0.9	0.0	-4.9	0.0	1/1/03	0.0	5.8	0.9	0.0		0.0
1/2/03	0.0	5.8	0.0	0.0	-9.0	3.2	1/2/03	0.0	5.8	0.0	0.0	-5.8	0.0
1/3/03	0.0	2.7	0.0	0.0	-1.2	-1.5	1/3/03	0.2	1.9	0.0	0.0	2.0	-3.9
1/4/03	17.0	4.1	0.0	0.0	10.9	2.0	1/4/03	0.1	2.0	0.0	0.0	14.5	0.1
1/5/03	13.8	2.2	0.0	0.0	10.9	0.7	1/5/03	2.7	0.5	0.0	0.0	13.6	-1.4
1/6/03	10.6	1.4	0.0	0.1	9.3	-0.2	1/6/03	7.3	0.2	0.0	0.1	9.0	-0.4
1/7/03	7.1	1.6	0.0	0.1	5.6	-0.2	1/7/03	6.2	0.2	0.0	0.1	3.9	0.1
1/8/03	5.0	1.7	0.1	0.2	3.3	-0.2	1/8/03	5.7	0.3	0.1	0.2	1.9	0.1
1/9/03	4.0	1.9	0.0	0.1	2.1	-0.1	1/9/03	4.9	0.3	0.0	0.2	1.5	0.1
1/10/03	3.4	2.0	0.0	0.0	1.3	0.1	1/10/03	4.9	0.5	0.0	0.0	0.1	0.1
1/11/03	3.7	1.9	0.0	0.1	1.2	0.5	1/11/03	5.6	0.5	0.0	0.1	0.6	0.0
1/12/03	4.2	1.4	0.0	0.1	2.0	0.7	1/12/03	5.4	0.3	0.0	0.1	1.9	-0.2
1/13/03	4.8	0.8	0.0	0.2	3.9	-0.1	1/13/03	5.6	0.0	0.0	0.2	3.2	-0.3
1/14/03	5.4	0.9	0.0	0.2	4.4	-0.1	1/14/03	14.9	0.0	0.0	0.2	3.8	0.0
1/15/03	5.7	1.0	0.0	0.2	4.6	-0.2	1/15/03	6.1	0.1	0.0	0.2	4.1	0.1
1/16/03	5.5	1.2	0.0	0.1	4.5	-0.2	1/16/03	7.9	0.2	0.0	0.1	3.9	0.1
1/17/03	5.3	1.3	0.0	0.1	4.0	0.0	1/17/03	12.7	0.4	0.0	0.1	3.7	0.2
1/18/03	5.1	1.4	0.0	0.2	3.4	0.1	1/18/03	13.3	0.5	0.0	0.2	4.0	0.0
1/19/03	4.9	1.2	0.0	0.2	2.8	0.6	1/19/03	10.3	0.4	0.0	0.2	4.5	-0.1
1/20/03	4.5	0.7	0.1	0.1	3.4	0.4	1/20/03	9.4	0.2	0.1	0.1	5.3	-0.3
1/21/03	3.5	0.3	0.0	0.2	2.9	0.2	1/21/03	9.2	0.0	0.0	0.2	4.7	-0.1
1/22/03	3.6	0.1	0.0	0.2	3.4	0.0	1/22/03	9.5	0.0	0.0	0.2	5.0	0.0
1/23/03	3.9	0.1	0.0	0.0	4.3	-0.6	1/23/03	9.4	0.0	0.0	0.0	4.4	0.0
1/24/03	4.7	0.7	0.0	0.1	4.3	-0.4	1/24/03	6.2	0.0	0.0	0.1	4.6	0.0
1/25/03	4.9	1.1	0.0	0.0	3.7	0.1	1/25/03	4.4	0.0	0.0	0.0	4.5	0.0
1/26/03	5.1	1.0	0.0	0.1	4.1	-0.1	1/26/03	4.7	0.4	0.0	0.1	3.7	0.4
1/27/03	5.3	1.1	0.1	0.1	4.3	-0.1	1/27/03	4.1	0.4	0.1	0.1	4.0	0.0
1/28/03	5.4	1.1	0.1	0.0	4.4	-0.1	1/28/03	4.3	0.5	0.1	0.0	3.8	0.0
1/29/03	5.1	1.2	0.1	0.1	3.9	-0.1	1/29/03	4.2	0.5	0.1	0.2	4.1	0.0
1/30/03	4.5	1.3	0.0	0.2	3.0	-0.1	1/30/03	4.9	0.5	0.0	0.2	4.5	0.0
1/31/03	4.7	1.4	0.0	0.2	3.2	0.0	1/31/03	5.7	0.5	0.0	0.2	2.5	0.0
2/1/03	22.3	1.4	0.1	0.1	20.9	0.0	2/1/03	4.3	0.5	0.1	0.1	19.8	0.0
2/2/03	26.9	1.4	0.0	0.4	27.4	-2.2	2/2/03	3.5	0.5	0.0	0.4	24.4	0.0
2/3/03	27.0	3.6	0.2	0.2	48.9	-25.6	2/3/03	9.1	1.2	0.2	0.2	22.4	0.7
2/4/03	26.7	29.2	0.1	0.0	6.2	-8.6	2/4/03	16.4	26.5	0.1	0.1	-27.9	25.4
2/5/03	26.6	37.8	0.0	0.1	-27.0	15.7	2/5/03	14.1	71.8	0.0	0.1	-98.5	45.2
2/6/03	25.8	22.1	0.0	0.4	-4.1	7.3	2/6/03	14.5	27.2	0.0	0.4	44.1	-44.5
2/7/03	23.3	14.8	0.0	0.6	7.9	0.1	2/7/03	14.3	10.0	0.0	0.6	35.6	-17.2
2/8/03	10.4	14.8	0.0	0.5	-4.8	0.0	2/8/03	9.5	10.3	0.0	0.5	0.9	0.3
2/9/03	5.1	14.8	0.0	0.5	-14.1	3.9	2/9/03	6.1	9.3	0.0	0.5	-3.7	-1.0
2/10/03	5.4	10.8	0.2	0.4	-12.2	6.6	2/10/03	3.0	6.4	0.2	0.4	1.2	-3.0
2/11/03	5.9	4.3	0.0	0.1	0.9	0.6	2/11/03	2.6	1.4	0.0	0.1	8.1	-4.9
2/12/03	5.9	3.6	0.0	0.1	2.3	-0.1	2/12/03	5.2	1.1	0.0	0.1	4.0	-0.4
2/13/03	5.7	3.7	0.0	0.3	0.5	1.2	2/13/03	5.5	2.5	0.0	0.3	0.1	1.5
2/14/03	5.5	2.5	0.0	0.5	1.5	0.9	2/14/03	6.0	2.5	0.0	0.5	0.9	0.0
2/15/03	5.5	1.6	0.0	0.5	3.3	0.1	2/15/03	7.2	1.8	0.0	0.5	2.4	-0.8
2/16/03	5.4	1.6	0.0	0.1	3.6	0.2	2/16/03	7.4	1.8	0.0	0.1	2.0	0.0
2/17/03	5.4	1.4	0.1	0.1	4.1	0.0	2/17/03	7.0	1.9	0.1	0.1	1.9	0.1
2/18/03	5.4	1.4	0.0	0.0	4.0	0.0	2/18/03	4.4	1.9	0.0	0.0	2.0	0.0
2/19/03	5.4	1.4	0.1	0.1	4.3	-0.2	2/19/03	4.2	1.9	0.1	0.1	2.0	0.0
2/20/03	6.3	1.6	0.1	0.1	4.4	0.2	2/20/03	6.8	2.2	0.1	0.1	1.9	0.3
2/21/03	5.4	1.4	0.0	0.2	3.8	0.0	2/21/03	4.9	1.9	0.0	0.2	2.0	-0.3
2/22/03	5.4	1.4	1.8	0.4	5.5	0.0	2/22/03	4.7	1.9	1.8	0.4	3.3	0.0
2/23/03	5.7	1.4	0.1	0.1	4.3	0.0	2/23/03	3.8	1.9	0.1	0.1	1.6	0.0
2/24/03	5.9	1.4	0.0	0.2	4.4	0.0	2/24/03	4.1	1.9	0.0	0.2	1.3	0.0
2/25/03	5.4	1.4	0.0	0.6	3.5	0.0	2/25/03	7.2	1.9	0.0	0.6	0.5	0.0

Wetland 1							Wetland 2						
Date	Inf.	Outf.	Precip.	Evap.	Seep	D Vol.	Date	Inf.	Outf.	Precip.	Evap.	Seep.	D Vol.
2/26/03	5.2	1.4	0.0	0.4	4.5	-1.1	2/26/03	6.0	1.9	0.0	0.4	-1.0	0.0
2/27/03	4.5	2.4	0.0	0.5	2.3	-0.6	2/27/03	3.8	2.3	0.0	0.5	-1.5	0.4
2/28/03	7.6	3.0	0.0	0.3	3.5	0.7	2/28/03	3.6	3.1	0.0	0.3	1.6	0.8
3/1/03	13.5	2.3	0.0	0.3	10.8	0.0	3/1/03	2.5	2.7	0.0	0.3	9.3	-0.4
3/2/03	19.4	2.3	0.0	0.3	16.7	0.0	3/2/03	2.3	1.9	0.0	0.3	16.4	-0.7
3/3/03	25.2	2.3	0.0	0.1	22.7	0.0	3/3/03	1.1	1.9	0.0	0.1	22.0	0.0
3/4/03	27.3	2.3	0.0	0.2	27.1	-2.3	3/4/03	0.7	1.9	0.0	0.2	24.6	0.0
3/5/03	21.4	4.6	0.2	0.3	14.5	2.2	3/5/03	3.4	4.1	0.2	0.3	15.3	2.2
3/6/03	13.5	2.3	0.2	0.4	24.0	-13.0	3/6/03	2.5	2.7	0.2	0.4	10.5	-1.5
3/7/03	17.0	15.4	0.0	0.4	0.7	0.6	3/7/03	3.5	16.1	0.0	0.4	-13.5	13.5
3/8/03	14.7	14.8	0.2	0.1	0.8	-0.7	3/8/03	3.3	19.5	0.2	0.1	-9.8	3.4
3/9/03	12.4	15.5	0.0	0.1	-7.0	3.8	3/9/03	2.4	12.8	0.0	0.1	3.6	-6.8
3/10/03	10.1	11.7	0.0	0.3	-5.9	4.0	3/10/03	1.2	6.9	0.0	0.3	5.1	-5.9
3/11/03	6.7	7.8	0.0	0.4	-4.4	2.9	3/11/03	1.1	4.2	0.0	0.4	2.0	-2.7
3/12/03	3.9	4.9	0.0	0.3	-3.4	2.0	3/12/03	2.5	2.2	0.0	0.3	2.9	-1.9
3/13/03	4.0	2.8	0.6	0.4	0.1	1.3	3/13/03	2.1	1.0	0.6	0.4	3.4	-1.2
3/14/03	4.0	1.6	0.0	0.4	1.7	0.3	3/14/03	2.0	0.7	0.0	0.5	2.3	-0.3
3/15/03	3.7	1.2	0.0	0.4	2.1	-0.1	3/15/03	2.5	0.8	0.0	0.5	1.5	0.2
3/16/03	4.6	1.3	0.0	0.5	2.9	0.0	3/16/03	3.1	0.7	0.0	0.5	1.7	-0.2
3/17/03	4.8	1.3	0.0	0.1	5.6	-2.3	3/17/03	2.4	0.3	0.0	0.1	2.8	-0.4
3/18/03	5.1	3.6	0.0	0.1	2.7	-1.3	3/18/03	4.5	1.6	0.0	0.2	0.6	1.3
3/19/03	6.1	4.9	0.1	0.3	1.3	-0.2	3/19/03	4.2	1.2	0.1	0.3	4.3	-0.4
3/20/03	5.6	5.1	0.1	0.1	0.1	0.3	3/20/03	3.6	0.4	0.1	0.1	4.3	-0.8
3/21/03	4.6	4.8	0.1	0.1	-1.8	1.7	3/21/03	4.4	0.4	0.1	0.1	2.9	0.0
3/22/03	3.7	3.1	0.0	0.3	0.1	0.2	3/22/03	4.1	0.8	0.0	0.3	2.1	0.4
3/23/03	3.5	2.9	0.0	0.4	-0.1	0.3	3/23/03	3.7	1.4	0.0	0.4	1.3	0.6
3/24/03	3.3	2.5	0.0	0.5	-0.1	0.4	3/24/03	3.3	1.2	0.0	0.5	2.1	-0.2
3/25/03	3.2	2.1	0.8	0.3	1.0	0.7	3/25/03	3.2	1.4	0.8	0.3	3.2	0.2
3/26/03	3.3	1.5	0.0	0.6	0.7	0.5	3/26/03	2.9	2.4	0.0	0.6	3.5	1.1
3/27/03	3.7	1.0	0.0	0.5	2.2	0.0	3/27/03	3.0	3.9	0.0	0.6	-3.3	1.5
3/28/03	3.4	0.9	0.0	0.3	2.2	-0.1	3/28/03	3.5	3.7	0.0	0.3	-1.3	-0.2
3/29/03	2.9	1.0	1.2	0.4	2.6	0.2	3/29/03	3.6	1.4	1.2	0.4	4.0	-2.3
3/30/03	2.5	0.8	0.0	0.4	2.5	-1.2	3/30/03	3.8	0.8	0.0	0.4	1.3	-0.6
3/31/03	4.1	2.1	0.0	0.4	1.1	0.5	3/31/03	3.9	2.1	0.0	0.4	-0.1	1.2
4/1/03	23.2	1.6	0.0	0.1	21.2	0.4	4/1/03	1.8	1.3	0.0	0.1	24.4	-0.7
4/2/03	24.3	1.2	0.0	0.1	25.1	-2.1	4/2/03	4.7	0.8	0.0	0.1	25.3	-0.6
4/3/03	24.5	3.4	0.0	0.1	28.6	-7.6	4/3/03	3.6	1.7	0.0	0.1	23.4	0.9
4/4/03	23.1	10.9	0.0	0.1	14.2	-2.1	4/4/03	2.5	6.3	0.0	0.1	15.7	4.6
4/5/03	24.2	13.1	1.8	0.2	14.1	-1.3	4/5/03	2.3	4.7	1.8	0.2	24.8	-1.5
4/6/03	25.7	14.4	0.0	0.2	9.5	1.6	4/6/03	2.2	2.8	0.0	0.2	25.1	-1.9
4/7/03	20.2	12.7	1.0	0.1	8.4	0.0	4/7/03	1.4	5.6	1.0	0.1	12.5	2.7
4/8/03	12.0	12.7	0.0	0.1	-0.8	0.0	4/8/03	0.0	5.6	0.0	0.1	11.0	0.0
4/9/03	5.1	12.7	0.0	0.1	-10.2	2.5	4/9/03	0.0	5.6	0.0	0.1	-1.5	0.0
4/10/03	3.5	10.3	0.0	0.2	-8.2	1.3	4/10/03	0.0	6.1	0.0	0.2	-3.2	0.5
4/11/03	6.4	9.0	0.0	0.2	-9.0	6.2	4/11/03	0.0	5.4	0.0	0.2	-2.0	-0.7
4/12/03	4.8	2.8	0.0	0.2	0.6	1.3	4/12/03	0.0	2.2	0.0	0.2	3.5	-3.2
4/13/03	4.2	1.5	0.0	0.1	2.6	-0.1	4/13/03	0.0	1.8	0.0	0.1	1.2	-0.5
4/14/03	3.7	1.5	0.0	0.1	1.3	0.8	4/14/03	0.0	1.3	0.0	0.1	1.7	-0.4
4/15/03	3.2	0.8	0.0	0.1	2.2	0.1	4/15/03	0.0	0.9	0.0	0.1	2.1	-0.4
4/16/03	3.1	0.7	0.0	0.1	2.3	0.0	4/16/03	0.0	0.9	0.0	0.1	2.3	0.0
4/17/03	3.9	0.7	0.1	0.2	3.1	0.0	4/17/03	0.0	0.9	0.1	0.2	1.9	0.0
4/18/03	3.1	0.7	0.0	0.1	2.4	0.0	4/18/03	0.0	0.9	0.0	0.1	2.2	0.0
4/19/03	2.5	0.7	0.0	0.0	1.7	0.1	4/19/03	0.0	0.9	0.0	0.0	2.4	0.0
4/20/03	2.0	0.6	2.1	0.2	3.2	0.1	4/20/03	0.0	6.7	2.1	0.2	-8.9	5.8
4/21/03	2.0	0.5	0.0	0.1	1.4	0.0	4/21/03	0.0	12.6	0.0	0.1	-18.3	5.9
4/22/03	3.6	0.5	0.0	0.1	3.0	0.0	4/22/03	0.0	12.7	0.0	0.1	-10.0	0.0
4/23/03	2.7	0.5	0.0	0.2	1.9	0.1	4/23/03	0.0	12.7	0.0	0.2	-9.7	0.0
4/24/03	2.9	0.4	0.0	0.2	2.5	-0.1	4/24/03	1.2	3.5	0.0	0.2	8.6	-9.2
4/25/03	5.0	0.5	0.0	0.1	4.2	0.1	4/25/03	0.0	0.5	0.0	0.1	5.9	-3.0

Wetland 1							Wetland 2						
Date	Inf.	Outf.	Precip.	Evap.	Seep	D Vol.	Date	Inf.	Outf.	Precip.	Evap.	Seep.	D Vol.
4/26/03	5.9	0.4	0.0	0.1	5.3	0.1	4/26/03	0.0	0.4	0.0	0.1	4.9	-0.1
4/27/03	5.7	0.2	0.0	0.2	5.9	-0.7	4/27/03	0.0	0.5	0.0	0.2	4.8	0.1
4/28/03	5.1	0.9	0.1	0.2	4.4	-0.3	4/28/03	0.1	0.9	0.1	0.2	3.4	0.5
4/29/03	4.5	1.2	0.0	0.2	2.9	0.2	4/29/03	0.3	0.8	0.0	0.2	3.8	-0.1
4/30/03	4.8	1.0	0.4	0.1	4.0	0.0	4/30/03	2.6	0.6	0.4	0.1	5.5	-0.3
5/1/03	23.4	0.9	1.0	0.0	23.6	-0.2	5/1/03	0.8	0.5	1.0	0.0	13.9	-0.1
5/2/03	25.9	1.1	0.0	0.2	24.9	-0.2	5/2/03	0.0	0.4	0.0	0.2	28.0	-0.1
5/3/03	26.4	1.3	0.1	0.1	28.0	-3.0	5/3/03	0.0	0.8	0.1	0.1	27.5	0.5
5/4/03	26.1	4.3	0.1	0.0	27.3	-5.6	5/4/03	0.0	3.2	0.1	0.0	23.6	2.4
5/5/03	25.9	9.9	5.4	0.0	25.4	-4.0	5/5/03	0.0	6.8	5.4	0.0	25.4	3.5
5/6/03	25.2	13.9	0.0	0.0	10.0	1.3	5/6/03	0.1	9.1	0.0	0.0	16.5	2.3
5/7/03	22.0	12.5	3.7	0.1	26.0	-12.9	5/7/03	0.6	9.9	3.7	0.1	8.0	0.8
5/8/03	35.4	25.5	0.0	0.0	3.3	6.6	5/8/03	6.7	19.5	0.0	0.0	3.1	9.6
5/9/03	2.5	18.9	2.3	0.1	-14.5	0.3	5/9/03	6.7	12.0	2.3	0.1	-0.4	-7.5
5/10/03	1.2	18.6	3.8	0.0	-2.9	-10.6	5/10/03	0.7	54.2	3.8	0.0	-92.2	42.2
5/11/03	1.6	29.2	0.2	0.1	-37.9	10.4	5/11/03	0.0	58.0	0.2	0.1	-60.7	3.8
5/12/03	7.6	18.8	0.0	0.2	-18.5	7.2	5/12/03	0.0	32.3	0.0	0.2	-1.0	-25.7
5/13/03	3.4	11.6	0.0	1.4	-17.3	7.6	5/13/03	0.0	9.5	0.0	1.4	14.4	-22.8
5/14/03	2.5	4.0	0.1	0.0	-2.5	1.2	5/14/03	0.0	6.7	0.1	0.0	-3.7	-2.8
5/15/03	5.6	2.8	2.8	0.0	5.6	0.1	5/15/03	0.0	6.2	2.8	0.0	-2.0	-0.5
5/16/03	5.3	2.7	0.0	0.1	2.0	0.5	5/16/03	1.9	6.5	0.0	0.1	-2.8	0.3
5/17/03	5.4	2.2	0.4	0.3	3.6	-0.3	5/17/03	0.0	5.5	0.4	0.3	-2.5	-1.1
5/18/03	4.6	2.5	0.0	0.0	2.1	0.0	5/18/03	0.0	5.6	0.0	0.0	-4.0	0.1
5/19/03	0.8	2.5	0.0	0.0	-1.7	0.0	5/19/03	0.0	4.5	0.0	0.0	-3.0	-1.1
5/20/03	1.6	2.5	5.4	0.0	5.2	-0.6	5/20/03	0.0	2.8	5.4	0.0	4.9	-1.6
5/21/03	0.0	3.2	0.0	0.0	-5.2	2.0	5/21/03	0.0	3.8	0.0	0.0	-4.7	0.9
5/22/03	3.8	1.2	0.0	0.0	2.6	0.1	5/22/03	0.0	2.5	0.0	0.0	2.5	-1.3
5/23/03	21.8	1.1	0.0	2.3	18.0	0.4	5/23/03	4.5	2.1	0.0	2.3	17.2	-0.4
5/24/03	13.1	0.7	0.0	0.0	12.8	-0.3	5/24/03	0.0	1.3	0.0	0.0	14.9	-0.8
5/25/03	5.1	1.0	0.6	0.1	6.4	-1.7	5/25/03	0.0	0.7	0.6	0.1	6.1	-0.5
5/26/03	5.4	2.7	0.0	0.2	4.6	-2.2	5/26/03	0.0	3.1	0.0	0.2	-1.4	2.4
5/27/03	2.2	5.0	1.1	0.1	-1.8	0.0	5/27/03	7.9	6.1	1.1	0.1	-5.9	3.0
5/28/03	2.8	5.0	0.1	0.3	-2.4	0.1	5/28/03	12.8	6.3	0.1	0.3	-3.4	0.2
5/29/03	0.8	4.9	0.0	0.1	-5.4	1.2	5/29/03	0.9	6.4	0.0	0.1	-5.7	0.1
5/30/03	1.9	3.7	0.0	0.1	-1.4	-0.5	5/30/03	0.0	5.7	0.0	0.1	-3.2	-0.7
5/31/03	23.6	4.1	2.1	0.5	21.0	0.0	5/31/03	0.4	9.1	2.1	0.5	-5.3	3.4
6/1/03	23.6	4.1	0.0	0.0	20.0	-0.5	6/1/03	0.4	9.1	0.0	0.0	-3.5	0.0
6/2/03	26.9	4.7	0.0	0.1	22.5	-0.4	6/2/03	0.7	9.1	0.0	0.1	14.5	0.0
6/3/03	28.7	5.0	3.5	0.0	34.2	-7.0	6/3/03	1.1	9.1	3.5	0.0	15.7	0.0
6/4/03	16.1	12.0	0.0	0.2	29.9	-26.1	6/4/03	1.4	15.2	0.0	0.2	-5.5	6.1
6/5/03	2.7	38.1	0.0	0.1	-13.1	-22.4	6/5/03	2.2	32.0	0.0	0.1	-46.8	16.8
6/6/03	0.4	60.6	0.1	0.2	-48.1	-12.2	6/6/03	0.0	48.4	0.1	0.2	-64.5	16.4
6/7/03	1.1	72.7	0.1	0.1	-73.1	1.5	6/7/03	0.2	63.5	0.1	0.1	-77.5	15.1
6/8/03	1.7	71.3	0.8	0.2	-93.1	24.1	6/8/03	2.8	63.8	0.8	0.2	-61.7	0.3
6/9/03	2.4	47.2	0.0	0.2	-65.3	20.3	6/9/03	6.3	63.8	0.0	0.2	-61.5	0.0
6/10/03	3.0	26.8	0.0	0.2	-37.1	13.1	6/10/03	9.8	63.8	0.0	0.2	-60.8	0.0
6/11/03	3.3	13.7	0.5	0.2	-17.9	7.7	6/11/03	2.0	63.8	0.5	0.2	-60.0	0.0
6/12/03	1.7	6.0	0.8	0.2	-7.6	4.0	6/12/03	0.0	63.8	0.8	0.2	-61.4	0.0
6/13/03	0.1	2.0	0.3	0.3	-3.0	1.2	6/13/03	0.0	63.8	0.3	0.3	-63.6	0.0
6/14/03	14.6	0.8	0.1	0.0	14.1	-0.3	6/14/03	0.0	42.6	0.1	0.0	-9.4	-21.2
6/15/03	26.2	1.1	0.0	0.0	24.9	0.1	6/15/03	0.0	8.1	0.0	0.0	47.8	-34.5
6/16/03	10.4	1.1	0.1	0.1	8.9	0.3	6/16/03	0.0	0.8	0.1	0.1	17.7	-7.3
6/17/03	13.0	0.7	0.0	0.0	12.2	0.0	6/17/03	0.5	0.1	0.0	0.0	15.4	-0.7
6/18/03	10.7	0.7	0.0	0.1	10.2	-0.3	6/18/03	1.1	0.0	0.0	0.1	12.3	-0.1
6/19/03	9.2	1.1	0.0	0.1	9.5	-1.4	6/19/03	3.2	0.2	0.0	0.1	10.6	0.2
6/20/03	8.8	2.5	0.0	0.2	7.2	-1.1	6/20/03	2.5	1.9	0.0	0.2	4.7	1.7
6/21/03	8.4	3.6	0.0	0.5	3.6	0.6	6/21/03	3.6	3.8	0.0	0.5	-0.2	1.9
6/22/03	7.9	3.0	0.0	0.6	3.5	0.8	6/22/03	2.2	3.6	0.0	0.6	-0.8	-0.1
6/23/03	4.9	2.3	0.0	0.0	2.4	0.3	6/23/03	1.9	3.6	0.0	0.0	-0.3	0.0

Date	Inf.	Outf.	Precip.	Evap.	Seep	D Vol.	Date	Inf.	Outf.	Precip.	Evap.	Seep.	D Vol.
6/24/03	2.7	2.0	0.0	0.0	0.5	0.2	6/24/03	1.4	3.6	0.0	0.0	1.2	0.0
6/25/03	3.4	1.7	0.0	0.0	1.4	0.2	6/25/03	4.1	3.6	0.0	0.0	0.6	0.0
6/26/03	3.9	1.5	0.4	0.1	2.6	0.2	6/26/03	8.2	3.4	0.4	0.1	1.0	-0.3
6/27/03	3.7	1.3	0.0	0.1	2.1	0.2	6/27/03	7.4	2.7	0.0	0.1	1.6	-0.7
6/28/03	3.4	1.2	0.0	0.0	2.3	0.0	6/28/03	2.2	2.1	0.0	0.0	2.0	-0.6
6/29/03	3.4	1.2	0.0	0.0	2.6	-0.3	6/29/03	2.1	1.5	0.0	0.0	2.1	-0.5
6/30/03	3.5	1.5	0.0	0.1	2.1	-0.2	6/30/03	2.3	1.1	0.0	0.1	1.9	-0.4
7/1/03	3.5	1.7	0.0	0.5	1.1	0.2	7/1/03	0.6	0.9	0.0	0.5	1.3	-0.3
7/2/03	3.1	1.5	0.0	0.7	0.8	0.2	7/2/03	1.4	0.7	0.0	0.7	2.5	-0.1
7/3/03	3.8	1.2	0.0	0.7	1.7	0.2	7/3/03	8.3	0.6	0.0	0.7	1.6	-0.1
7/4/03	4.1	1.1	1.3	0.6	3.7	0.0	7/4/03	29.3	0.7	1.3	0.7	1.2	0.1
7/5/03	0.8	1.1	0.3	1.0	-1.1	0.0	7/5/03	27.8	1.5	0.3	1.0	-2.8	0.8
7/6/03	1.2	1.1	1.8	0.6	1.3	0.0	7/6/03	20.1	1.6	1.8	0.6	0.5	0.1
7/7/03	3.5	1.1	0.6	0.4	2.4	0.2	7/7/03	10.9	1.9	0.6	0.4	1.5	0.3
7/8/03	4.2	0.9	1.1	0.8	3.2	0.4	7/8/03	10.5	1.5	1.1	0.8	2.8	-0.4
7/9/03	3.7	0.4	0.7	0.9	3.0	0.2	7/9/03	21.6	0.8	0.7	0.9	1.4	-0.7
7/10/03	4.0	0.3	0.3	0.8	3.8	-0.5	7/10/03	33.3	0.5	0.3	0.8	0.7	-0.3
7/11/03	4.4	0.7	0.0	0.7	3.6	-0.6	7/11/03	26.5	1.2	0.0	0.8	-1.2	0.6
7/12/03	4.9	1.4	0.0	0.7	3.0	-0.3	7/12/03	29.0	1.9	0.0	0.7	-2.1	0.8
7/13/03	5.3	1.6	0.0	0.6	3.3	-0.3	7/13/03	28.6	2.1	0.0	0.6	-1.6	0.2
7/14/03	5.7	1.9	0.0	0.3	3.9	-0.3	7/14/03	24.9	2.3	0.0	0.3	-1.3	0.2
7/15/03	6.0	2.2	1.1	0.7	4.5	-0.3	7/15/03	23.5	2.4	1.1	0.7	1.2	0.2
7/16/03	4.1	2.5	0.0	1.4	0.5	-0.3	7/16/03	22.9	2.6	0.0	1.4	1.0	0.2
7/17/03	0.9	2.9	0.0	1.3	-3.2	0.0	7/17/03	29.6	2.8	0.0	1.3	1.4	0.2
7/18/03	3.1	2.9	0.0	1.0	-0.8	0.0	7/18/03	28.5	2.9	0.0	1.0	2.6	0.1
7/19/03	5.0	2.9	0.0	1.0	1.0	0.2	7/19/03	15.9	3.1	0.0	1.0	3.1	0.2
7/20/03	5.1	2.7	0.0	0.7	1.5	0.2	7/20/03	19.8	3.1	0.0	0.7	3.6	0.0
7/21/03	4.9	2.5	0.6	0.7	2.1	0.2	7/21/03	24.8	3.1	0.6	0.7	4.1	0.0
7/22/03	4.6	2.4	0.1	0.7	1.5	0.1	7/22/03	12.8	3.1	0.1	0.7	3.4	0.0
7/23/03	3.8	2.3	2.6	0.5	3.5	0.1	7/23/03	2.7	3.1	2.6	0.5	5.2	0.0
7/24/03	3.7	2.2	0.0	0.9	0.7	0.0	7/24/03	21.8	3.1	0.0	0.9	-0.2	0.0
7/25/03	3.8	2.3	0.0	0.6	1.2	-0.3	7/25/03	14.5	3.1	0.0	0.6	0.3	0.0
7/26/03	3.8	2.6	0.0	0.5	0.2	0.4	7/26/03	21.7	3.1	0.0	0.5	0.6	0.0
7/27/03	3.8	2.2	0.4	0.6	1.0	0.4	7/27/03	14.9	2.9	0.4	0.6	1.5	-0.2
7/28/03	3.9	1.9	0.1	0.6	1.2	0.3	7/28/03	11.0	2.7	0.1	0.6	1.6	-0.2
7/29/03	4.6	1.5	0.0	0.5	2.2	0.3	7/29/03	8.0	2.5	0.0	0.5	2.5	-0.2
7/30/03	3.9	1.3	0.0	0.5	1.9	0.2	7/30/03	18.0	2.3	0.0	0.5	3.6	-0.2
7/31/03	2.1	1.0	0.0	0.5	0.3	0.2	7/31/03	12.9	2.1	0.0	0.5	10.4	-0.2
8/1/03	4.1	0.9	0.0	0.4	2.5	0.4	8/1/03	13.1	2.2	0.0	0.4	2.1	0.0
8/2/03	19.6	0.5	1.7	0.3	20.4	0.0	8/2/03	12.8	2.4	1.7	0.3	18.2	0.2
8/3/03	33.1	0.5	1.2	0.2	33.5	0.0	8/3/03	12.5	2.0	1.2	0.2	32.4	-0.4
8/4/03	31.0	0.5	9.0	0.2	42.0	-2.6	8/4/03	12.6	1.9	9.0	0.2	39.2	-0.1
8/5/03	30.4	3.2	0.2	0.2	32.2	-4.9	8/5/03	12.6	4.3	0.2	0.2	30.6	2.4
8/6/03	30.1	8.1	0.0	0.4	30.1	-8.4	8/6/03	12.6	7.9	0.0	0.4	14.4	3.7
8/7/03	30.0	16.5	0.3	0.4	22.1	-8.7	8/7/03	11.9	10.0	0.3	0.4	13.6	2.1
8/8/03	28.1	25.2	0.0	0.3	-7.7	10.4	8/8/03	10.7	9.1	0.0	0.3	9.6	-0.9
8/9/03	27.8	14.8	0.0	0.3	11.5	1.2	8/9/03	12.1	8.6	0.0	0.3	-1.0	-0.5
8/10/03	3.9	13.6	0.0	0.4	-10.5	0.3	8/10/03	19.0	10.2	0.0	0.5	-11.5	1.6
8/11/03	1.1	13.3	0.1	0.4	-13.0	0.3	8/11/03	21.6	11.4	0.1	0.4	-12.7	1.2
8/12/03	0.8	13.0	0.0	0.7	-12.9	0.1	8/12/03	16.8	10.8	0.0	0.7	-10.7	-0.6
8/13/03	0.6	12.9	0.0	0.5	-15.3	2.6	8/13/03	11.1	9.6	0.0	0.5	-8.5	-1.3
8/14/03	0.4	10.3	0.0	0.6	-13.4	3.0	8/14/03	5.3	7.4	0.0	0.6	-5.7	-2.2
8/15/03	0.2	7.3	0.3	0.3	-9.4	2.3	8/15/03	6.7	4.9	0.3	0.3	-2.4	-2.5
8/16/03	0.7	5.0	0.2	0.5	-6.3	1.7	8/16/03	10.5	3.0	0.2	0.5	-0.7	-1.9
8/17/03	1.8	3.3	0.0	0.8	-3.5	1.2	8/17/03	4.6	1.7	0.0	0.8	0.6	-1.3
8/18/03	12.0	2.0	0.0	1.2	7.2	1.6	8/18/03	11.1	0.8	0.0	1.2	10.0	-0.9
8/19/03	12.0	0.4	0.0	0.8	10.6	0.2	8/19/03	11.1	0.1	0.0	0.8	10.9	-0.7
8/20/03	3.4	0.2	0.0	0.7	2.5	0.0	8/20/03	0.0	0.0	0.0	0.7	2.1	-0.1
8/21/03	4.0	0.3	0.0	0.6	3.2	0.0	8/21/03	0.0	0.0	0.0	0.6	2.5	0.0

Date	Inf.	Outf.	Precip.	Evap.	Seep	D Vol.	Date	Inf.	Outf.	Precip.	Evap.	Seep.	D Vol.
8/22/03	4.5	0.3	0.0	0.3	4.0	0.0	8/22/03	0.7	0.0	0.0	0.3	3.1	0.0
8/23/03	5.1	0.3	0.0	0.2	4.5	0.0	8/23/03	47.7	0.0	0.0	0.3	3.4	0.0
8/24/03	5.6	0.3	0.0	0.2	5.1	0.0	8/24/03	56.9	0.0	0.0	0.2	3.7	0.0
8/25/03	5.6	0.3	0.0	0.2	5.0	0.0	8/25/03	10.4	0.1	0.0	0.2	3.6	0.0
8/26/03	2.9	0.3	0.0	0.3	2.2	0.0	8/26/03	11.3	0.1	0.0	0.3	1.6	0.0
8/27/03	0.3	0.4	4.7	0.3	4.3	0.0	8/27/03	12.1	0.1	4.7	0.3	4.4	0.0
8/28/03	0.0	0.4	0.0	0.3	-0.6	-0.1	8/28/03	12.9	0.2	0.0	0.3	-0.7	0.1
8/29/03	0.0	0.5	8.0	0.3	7.1	0.1	8/29/03	13.6	0.7	8.0	0.3	6.6	0.4
8/30/03	0.0	0.3	7.2	0.3	6.7	0.0	8/30/03	14.3	0.7	7.2	0.3	6.2	0.0
8/31/03	0.0	0.4	0.0	0.3	15.9	-16.5	8/31/03	14.6	0.5	0.0	0.3	-0.6	-0.2
9/1/03	0.0	16.9	7.4	0.1	56.7	-66.4	9/1/03	14.1	9.3	7.4	0.1	-10.8	8.8
9/2/03	0.0	83.3	1.9	0.4	-141.2	59.4	9/2/03	8.7	31.6	1.9	0.4	-52.4	22.3
9/3/03	0.0	23.9	0.0	0.1	-44.1	20.1	9/3/03	12.2	10.2	0.0	0.1	11.0	-21.3
9/4/03	0.0	3.8	0.0	0.1	-3.2	-0.7	9/4/03	12.4	4.4	0.0	0.1	1.3	-5.8
9/5/03	0.0	4.5	0.0	0.3	-2.9	-1.9	9/5/03	11.8	5.6	0.0	0.3	-7.1	1.2
9/6/03	0.0	6.4	0.0	0.8	-1.6	-5.5	9/6/03	13.2	6.3	0.0	0.8	-7.8	0.7
9/7/03	0.0	11.9	0.0	0.0	-6.7	-5.3	9/7/03	22.5	6.9	0.0	0.0	-7.6	0.6
9/8/03	0.0	17.2	0.0	0.0	-16.6	-0.6	9/8/03	25.9	5.5	0.0	0.0	-4.1	-1.4
9/9/03	0.0	17.7	0.0	0.1	-26.9	9.1	9/9/03	28.1	3.9	0.0	0.1	-2.4	-1.6
9/10/03	0.0	8.6	0.0	0.0	-13.9	5.2	9/10/03	24.9	2.1	0.0	0.0	-0.2	-1.9
9/11/03	0.0	3.4	0.0	1.3	-7.2	2.4	9/11/03	23.0	0.9	0.0	1.3	-1.1	-1.2
9/12/03	0.0	1.0	0.0	0.0	-1.8	0.8	9/12/03	21.4	0.3	0.0	0.0	0.4	-0.6
9/13/03	0.0	0.2	0.0	0.0	-0.1	0.0	9/13/03	19.3	0.0	0.0	0.0	0.2	-0.2
9/14/03	0.0	0.2	0.0	0.5	-0.7	0.1	9/14/03	18.7	0.3	0.0	0.5	-0.9	0.2
9/15/03	0.0	0.1	0.1	0.2	-0.3	0.1	9/15/03	18.4	0.2	0.1	0.2	-0.3	0.0
9/16/03	0.0	0.0	0.0	0.2	-0.2	0.0	9/16/03	15.4	0.1	0.0	0.2	-0.1	-0.2
9/17/03	2.5	0.0	0.0	0.1	2.4	0.0	9/17/03	4.3	0.0	0.0	0.1	3.0	-0.1
9/18/03	16.8	0.0	0.0	0.2	16.6	0.0	9/18/03	0.0	0.0	0.0	0.2	3.3	0.0
9/19/03	15.0	0.0	0.2	1.0	14.8	-0.7	9/19/03	2.9	0.0	0.2	1.0	13.3	0.0
9/20/03	5.5	0.7	0.0	0.2	12.4	-7.8	9/20/03	17.2	0.4	0.0	0.2	1.5	0.4
9/21/03	5.3	8.5	0.0	0.2	1.7	-5.0	9/21/03	17.1	9.4	0.0	0.2	-13.9	9.0
9/22/03	2.7	13.5	6.0	1.0	-10.5	4.7	9/22/03	21.3	15.5	6.0	1.0	-14.2	6.1
9/23/03	5.3	8.8	0.0	0.1	-6.7	3.1	9/23/03	10.0	10.1	0.0	0.1	-0.2	-5.4
9/24/03	3.1	5.6	0.0	0.1	-1.4	-1.2	9/24/03	11.1	7.9	0.0	0.1	-2.6	-2.1
9/25/03	3.7	6.8	0.0	0.2	-3.9	0.5	9/25/03	11.0	8.9	0.0	0.2	-7.8	0.9
9/26/03	4.0	6.3	2.3	0.0	-1.9	1.9	9/26/03	5.6	9.1	2.3	0.0	-3.6	0.2
9/27/03	3.3	4.5	4.4	0.3	2.0	1.0	9/27/03	9.6	7.0	4.4	0.3	1.8	-2.1
9/28/03	3.3	3.5	0.0	0.0	-0.8	0.5	9/28/03	19.5	5.5	0.0	0.0	-2.1	-1.5
9/29/03	3.3	3.0	0.1	0.0	1.0	-0.7	9/29/03	25.6	4.7	0.1	0.0	-2.5	-0.8
9/30/03	2.2	3.7	0.0	0.0	-0.6	-0.9	9/30/03	21.0	5.3	0.0	0.0	-5.4	0.6
10/1/03	1.0	4.6	0.0	0.1	-2.8	-0.8	10/1/03	4.5	6.1	0.0	0.1	-6.8	0.8
10/2/03	0.2	5.4	0.0	0.0	-5.4	0.2	10/2/03	3.8	6.6	0.0	0.0	-7.1	0.5
10/3/03	5.5	5.2	0.1	0.0	-0.5	0.8	10/3/03	3.6	6.6	0.1	0.0	-0.4	0.0
10/4/03	8.8	4.4	0.0	0.0	3.0	1.4	10/4/03	3.2	5.2	0.0	0.0	5.8	-1.5
10/5/03	6.8	3.0	0.0	0.0	3.3	0.4	10/5/03	3.3	3.4	0.0	0.0	4.3	-1.8
10/6/03	5.2	2.6	0.0	0.1	5.0	-2.5	10/6/03	3.6	3.9	0.0	0.1	0.8	0.5
10/7/03	5.2	5.0	0.0	1.9	-0.5	-1.3	10/7/03	5.7	6.7	0.0	1.9	-7.8	2.7
10/8/03	4.7	6.3	0.0	2.2	-4.0	0.2	10/8/03	5.4	10.4	0.0	2.2	-13.7	3.8
10/9/03	4.6	6.1	0.0	0.0	-1.4	-0.1	10/9/03	3.8	9.6	0.0	0.0	-5.7	-0.9
10/10/03	3.9	6.2	0.0	0.2	-3.7	1.1	10/10/03	2.3	8.6	0.0	0.2	-5.6	-1.0
10/11/03	3.6	5.1	0.0	1.3	-3.9	1.0	10/11/03	4.2	7.8	0.0	1.3	-6.7	-0.8
10/12/03	3.5	4.1	0.0	0.1	-1.0	0.4	10/12/03	4.8	7.6	0.0	0.1	-5.3	-0.2
10/13/03	2.4	3.7	0.1	0.0	-2.6	1.4	10/13/03	5.3	6.8	0.1	0.0	-3.6	-0.7
10/14/03	2.8	2.3	4.0	2.0	1.9	0.6	10/14/03	5.2	5.8	4.0	2.0	-1.7	-1.1
10/15/03	4.4	1.7	0.0	0.2	2.0	0.5	10/15/03	5.1	5.0	0.0	0.2	0.8	-0.8
10/16/03	4.4	1.2	0.2	0.1	3.5	-0.1	10/16/03	4.9	4.9	0.2	0.1	0.8	-0.1
10/17/03	4.5	1.3	0.1	0.0	4.0	-0.8	10/17/03	2.5	6.4	0.1	0.0	-3.5	1.5
10/18/03	4.7	2.1	0.0	0.0	2.6	0.0	10/18/03	4.2	6.6	0.0	0.0	-2.8	0.3
10/19/03	5.3	2.0	0.0	0.1	3.4	-0.2	10/19/03	4.2	5.8	0.0	0.1	-2.9	-0.8

Date	Inf.	Outf.	Precip.	Evap.	Seep	D Vol.	Date	Inf.	Outf.	Precip.	Evap.	Seep.	D Vol.
10/20/03	5.5	2.2	0.0	1.1	2.2	0.0	10/20/03	4.3	5.5	0.0	1.1	-0.6	-0.3
10/21/03	4.1	2.2	0.0	0.1	1.4	0.4	10/21/03	4.5	5.4	0.0	0.1	0.0	-0.1
10/22/03	1.1	1.9	0.0	0.0	-0.8	0.0	10/22/03	4.5	4.9	0.0	0.0	1.9	-0.6
10/23/03	2.6	1.8	0.0	0.0	0.3	0.5	10/23/03	4.3	5.6	0.0	0.0	-0.5	0.7
10/24/03	5.7	1.3	0.0	0.0	4.2	0.3	10/24/03	4.4	5.3	0.0	0.0	1.0	-0.3
10/25/03	5.4	1.0	0.0	0.0	4.0	0.5	10/25/03	4.2	4.6	0.0	0.0	1.8	-0.6
10/26/03	5.5	0.5	0.8	0.1	5.5	0.3	10/26/03	4.0	2.7	0.8	0.1	3.2	-2.0
10/27/03	5.4	0.2	0.0	0.0	5.5	-0.3	10/27/03	6.0	2.5	0.0	0.0	8.4	-0.2
10/28/03	5.6	0.6	0.7	0.0	6.3	-0.6	10/28/03	22.2	3.3	0.7	0.0	5.9	0.8
10/29/03	3.1	1.1	0.0	0.1	2.2	-0.3	10/29/03	11.2	3.5	0.0	0.1	2.3	0.2
10/30/03	4.1	1.5	0.0	0.1	2.2	0.4	10/30/03	4.0	4.0	0.0	0.1	-1.0	0.5
10/31/03	3.9	1.1	0.0	0.5	2.2	0.1	10/31/03	19.2	4.2	0.0	0.5	-2.0	0.3
11/1/03	0.7	1.0	0.5	0.0	0.0	0.1	11/1/03	19.2	3.7	0.5	0.0	-2.0	-0.6
11/2/03	4.2	0.9	0.0	0.0	3.1	0.1	11/2/03	32.4	3.6	0.0	0.0	1.6	0.0
11/3/03	3.8	0.8	0.0	0.0	2.9	0.2	11/3/03	39.4	2.7	0.0	0.0	3.0	-0.9
11/4/03	10.8	0.6	0.0	0.0	9.9	0.3	11/4/03	49.8	2.1	0.0	0.0	5.5	-0.6
11/5/03	15.3	0.3	0.0	0.0	14.9	0.1	11/5/03	15.6	1.1	0.0	0.0	6.6	-1.0
11/6/03	14.1	0.1	0.1	0.1	14.8	-0.8	11/6/03	9.8	0.6	0.1	0.1	8.6	-0.5
11/7/03	12.9	0.9	0.0	0.0	13.7	-1.6	11/7/03	10.3	2.5	0.0	0.0	11.8	1.9
11/8/03	12.2	2.5	0.0	0.1	11.3	-1.6	11/8/03	9.8	4.9	0.0	0.1	13.4	2.4
11/9/03	11.8	4.1	0.0	0.1	7.3	0.4	11/9/03	10.1	5.9	0.0	0.1	9.0	1.0
11/10/03	13.3	3.7	0.0	0.0	9.1	0.5	11/10/03	10.9	4.7	0.0	0.0	8.6	-1.2
11/11/03	13.4	3.2	2.8	0.0	12.8	0.2	11/11/03	9.4	4.2	2.8	0.0	7.6	-0.5
11/12/03	12.6	3.0	0.3	0.0	9.7	0.2	11/12/03	3.5	3.8	0.3	0.0	3.8	-0.4
11/13/03	9.4	2.8	0.0	0.0	6.7	-0.2	11/13/03	3.0	3.6	0.0	0.0	3.2	-0.2
11/14/03	7.2	3.0	0.0	0.5	4.0	-0.3	11/14/03	4.8	3.4	0.0	0.6	5.1	-0.3
11/15/03	6.7	3.4	0.0	0.1	3.0	0.3	11/15/03	7.0	2.8	0.0	0.1	8.4	-0.6
11/16/03	6.5	3.1	0.0	0.2	3.2	0.1	11/16/03	7.4	2.9	0.0	0.2	4.1	0.1
11/17/03	3.8	2.9	0.0	0.0	1.0	-0.1	11/17/03	8.2	3.0	0.0	0.0	-0.4	0.1
11/18/03	2.0	3.0	0.7	0.1	-0.3	-0.1	11/18/03	9.0	2.8	0.7	0.1	-1.1	-0.3
11/19/03	1.6	3.1	0.3	0.0	-1.9	0.7	11/19/03	6.1	2.5	0.3	0.0	-1.3	-0.3
11/20/03	0.2	2.5	0.0	0.0	-3.7	1.4	11/20/03	3.8	1.9	0.0	0.0	-1.2	-0.6
11/21/03	2.3	1.1	0.0	0.0	0.8	0.4	11/21/03	26.3	1.1	0.0	0.0	2.3	-0.8
11/22/03	6.4	0.7	0.0	0.1	5.3	0.3	11/22/03	30.5	0.7	0.0	0.1	6.7	-0.4
11/23/03	6.3	0.3	0.0	0.3	5.7	0.0	11/23/03	30.0	0.3	0.0	0.3	8.0	-0.4
11/24/03	6.7	0.3	0.4	0.0	8.1	-1.3	11/24/03	29.7	0.3	0.4	0.0	7.3	0.1
11/25/03	6.9	1.6	0.0	0.0	6.0	-0.7	11/25/03	28.9	0.7	0.0	0.0	5.6	0.4
11/26/03	6.9	2.2	0.0	0.0	4.1	0.5	11/26/03	14.0	1.8	0.0	0.0	3.1	1.1
11/27/03	6.8	1.7	1.2	0.0	6.0	0.2	11/27/03	6.6	1.7	1.2	0.0	4.9	-0.1
11/28/03	6.7	1.5	1.4	0.1	6.4	0.1	11/28/03	1.5	1.6	1.4	0.1	4.6	-0.1
11/29/03	6.7	1.4	0.0	0.0	5.1	0.1	11/29/03	0.0	1.5	0.0	0.0	2.7	-0.1
11/30/03	6.6	1.4	0.0	0.1	5.1	0.1	11/30/03	0.0	1.4	0.0	0.1	2.1	-0.1
12/1/03	6.2	1.3	0.0	0.0	4.8	0.1	12/1/03	0.0	1.3	0.0	0.0	-0.7	-0.1
12/2/03	4.8	1.2	0.0	0.0	3.5	0.1	12/2/03	0.0	1.2	0.0	0.0	2.0	-0.1
12/3/03	4.2	1.2	0.0	0.0	2.9	0.1	12/3/03	0.0	1.1	0.0	0.0	1.8	-0.1
12/4/03	3.8	1.1	0.1	0.0	1.6	1.1	12/4/03	0.0	1.1	0.1	0.0	0.9	0.0
12/5/03	3.6	0.0	1.4	0.0	5.0	0.0	12/5/03	0.0	0.0	1.4	0.0	4.1	-1.1
12/6/03	3.5	0.0	0.0	0.0	3.5	0.0	12/6/03	0.0	0.0	0.0	0.0	1.9	0.0
12/7/03	3.7	0.0	0.0	0.0	3.7	0.0	12/7/03	0.0	0.0	0.0	0.0	3.2	0.0
12/8/03	2.3	0.0	0.0	0.0	2.3	0.0	12/8/03	0.0	0.0	0.0	0.0	1.1	0.0
12/9/03	0.3	0.0	0.0	0.1	0.2	0.0	12/9/03	0.0	0.0	0.0	0.1	0.2	0.0
12/10/03	3.3	0.0	1.6	0.0	4.9	0.0	12/10/03	0.0	0.0	1.6	0.0	4.7	0.0
12/11/03	7.3	0.0	0.0	0.0	7.3	0.0	12/11/03	0.0	0.0	0.0	0.0	2.5	0.0
12/12/03	4.6	0.0	0.0	0.0	4.6	0.0	12/12/03	0.0	0.0	0.0	0.0	2.4	0.0
12/13/03	1.2	0.0	0.0	0.0	1.2	0.0	12/13/03	0.0	0.0	0.0	0.0	2.4	0.0
12/14/03	1.0	0.0	0.1	0.0	1.0	0.0	12/14/03	0.0	0.0	0.1	0.0	2.5	0.0
12/15/03	0.8	0.0	0.0	0.0	0.8	0.0	12/15/03	0.0	0.0	0.0	0.0	2.5	0.0
12/16/03	0.6	0.0	0.6	0.0	1.2	0.0	12/16/03	0.0	0.0	0.6	0.0	3.2	0.0
12/17/03	0.4	0.0	0.0	0.0	0.4	0.0	12/17/03	0.0	0.0	0.0	0.0	2.6	0.0

Date	Inf.	Outf.	Precip.	Evap.	Seep	D Vol.	Date	Inf.	Outf.	Precip.	Evap.	Seep.	D Vol.
12/18/03	0.2	0.0	0.0	0.0	0.2	0.0	12/18/03	0.0	0.0	0.0	0.0	2.7	0.0
12/19/03	1.9	0.0	0.0	0.0	1.9	0.0	12/19/03	0.0	0.0	0.0	0.0	2.3	0.0
12/20/03	3.9	0.0	0.0	0.0	3.9	0.0	12/20/03	0.0	0.0	0.0	0.0	1.9	0.0
12/21/03	4.1	0.0	0.0	0.0	4.1	0.0	12/21/03	0.0	0.0	0.0	0.0	2.0	0.0
12/22/03	4.3	0.0	0.0	0.2	4.0	0.0	12/22/03	0.0	0.0	0.0	0.2	1.9	0.0
12/23/03	4.5	0.0	0.8	0.1	5.2	0.0	12/23/03	0.0	0.0	0.8	0.1	2.9	0.0
12/24/03	4.7	0.0	0.0	0.1	4.6	0.0	12/24/03	0.0	0.0	0.0	0.1	2.2	0.0
12/25/03	4.9	0.0	0.0	0.1	4.8	0.0	12/25/03	0.0	0.0	0.0	0.1	2.3	0.0
12/26/03	5.1	0.0	0.0	0.0	5.1	0.0	12/26/03	0.0	0.0	0.0	0.0	2.5	0.0
12/27/03	5.3	0.0	0.0	0.0	5.3	0.0	12/27/03	0.0	0.0	0.0	0.0	2.6	0.0
12/28/03	5.5	0.0	0.0	0.0	5.5	0.0	12/28/03	0.0	0.0	0.0	0.0	2.7	0.0
12/29/03	5.7	0.0	1.4	0.1	7.0	0.0	12/29/03	0.0	0.0	1.4	0.1	4.1	0.0
12/30/03	5.9	0.0	0.1	0.1	5.9	0.0	12/30/03	0.0	0.0	0.1	0.1	2.9	0.0
12/31/03	4.1	0.0	0.0	0.0	4.1	0.0	12/31/03	0.0	0.0	0.0	0.0	2.0	0.0